INSTRUCTION MANUAL

SELECTIVE VOLTMETER

Models 3135, 3136

RYCOM INSTRUMENTS INC.
9351 East 59th Street.
Raytown, Missouri, 64133

INSTRUCTION MANUAL

SELECTIVE VOLTMETER

Models 3135, 3136

Serial No. _____

Manual Part No. 030 00023 00

CALIBRATION / SERVICE SPECIFICATION GTE EQUIPMENT SERVICES	
ITEM NAME: Selective Voltmeter	SPEC NO: ESC-1226-92-01
MANUFACTURER: Rycom	DATE: 03/04/92
MODEL: 3135/3136/3136A	APPROVED: Scp

CALIBRATION REQUIREMENTS

SOURCE: GTE NORTH	COPIES ISSUED:	MAXIMUM INTERVAL: 12 MONTHS

APPLICABLE PAGES FOR TECHNICIANS USE.

ALL PAGES ARE APPLICABLE.

MISCELLANEOUS NOTES.

REQUIRED CALIBRATION STICKER.

Calibration: X
Performance Check: ___
Limited Calibration: ___
Primary Standards: ___
Other: ___ (see misc. notes)

TAMPER PROOF SEAL REQUIRED.

YES X NO ___

If Applicable

Addendum
3135, 3136 Selective Voltmeter

Page 6, Table 2. Operating Controls and Indicators, the statement on "POWER" and "Model 3136 INPUT SELECTOR" should read as follows:

PANEL MARKING	DESCRIPTION	FUNCTION
INPUT SELECTOR		
Model 3136	9-position rotary switch	1. Selects input terminations of BRIDGE, 600-, 135-, or 75-ohm input with TERM-UNTERM switch in TERM position; BALANCED or UNBALANCED. In the UNBALANCED position, the center input terminal (E2) is connected to case ground. 2. Selects CAL position for operational calibration. In CAL position, the input is unbalanced with the center input terminal (E2) connected to case ground.
POWER	4-position rotary switch spring loaded in BAT. TEST position	Connects power supply to ac line, battery, or battery test circuit and selects charge rate, AC (trickle) or BAT. (full).

Page 7, paragraph 3. BATTERY should read as follows:

The battery will provide up to 16 hours of operation between charges. A completely discharged battery will recharge in 35 hours. A routine recharging schedule should be established, dependent upon instrument use, but the battery should be charged at least once per month. With continuous ac operation, battery charging is unnecessary.

a. To charge battery, connect instrument to primary source (115 V ac) and set POWER switch to BAT. The instrument may be operated while the battery is charging.

b. To test condition of battery while it is delivering full load current, set POWER switch to BAT. TEST. Battery requires charging when the meter indicates below 0 dBm.

Page 10, paragraph 7. LINE MEASUREMENTS, MODEL 3136 should read as follows:

a. To make measurements below 500 Hz, perform the following:

(1) Remove the ac line cord from the 115 VAC receptacle to avoid possible spurious responses at 60 Hz harmonics.

(2) Set POWER switch to BAT. for battery operation. For AC operation, either the A.C. or BAT. position may be used. The A.C. position provides a trickle charge while the BAT. position provides a more rapid charge to the battery.

(3) Calibrate the instrument according to paragraph 4.

(4) Set INPUT SELECTOR switch to desired impedance and balanced or unbalanced input configuration. See paragraph 5.

(5) Set TERM-UNTERM switch to desired termination.

(6) Connect the instrument INPUT jacks to the circuit to be tested.

(7) Set BAND SELECTOR switch and adjust TUNING control to frequency of signal to be measured.

(8) Set ATTENUATOR switch so meter indicates in upper 2/3 of scale.

(9) Adjust TUNING control for maximum indication of meter.

(10) Read meter indication in dBm. To obtain the input signal level, algebraically add meter indication to ATTENUATOR switch setting.

b. To make measurements above 500 Hz, perform steps (2) thru (10).

Page 16, paragraph 11. AC POWER SUPPLY AND CHARGER ASSEMBLY A6. Change "approximately 65 milliamperes" to approximately 40 milliamperes".

Model 3135, Serial No. 403 up
Model 3136, Serial No. 240 up

Page 30, Add the following:

L4	Parasitic Suppressor	701 00035 00	1

Page 31, change the following to:

A1C1	Cap, 0.47 uF ±20%m 200 wvdc, mylar	620 00025 03	1

Page 1A of addendum , in the table under function change (2.) to read as follows:

2. Selects CAL position for operational calibration. For most units Serial No. 101-284. In CAL position, the input is unbalanced with the center input terminal (E2) connected to case ground.

Page 30, change the following to:

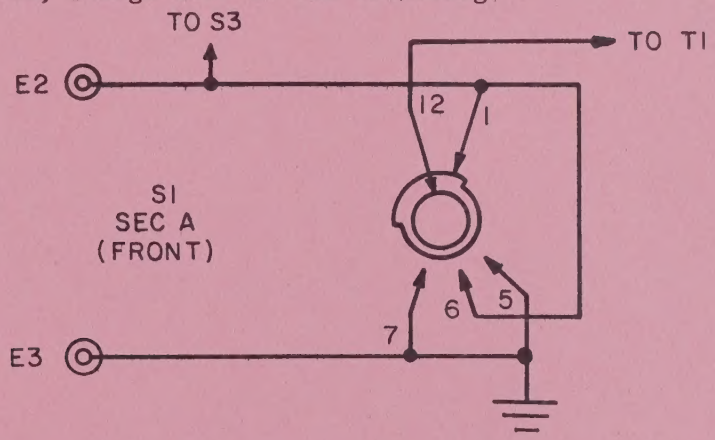
LS1	Loudspeaker	743 00003 00	1

Model 3136, Serial No. 285 up

Page 32, change the following to:

A1S1	Switch, rotary, 4-pole, 9-pos, 4-deck	720 00049 00	1

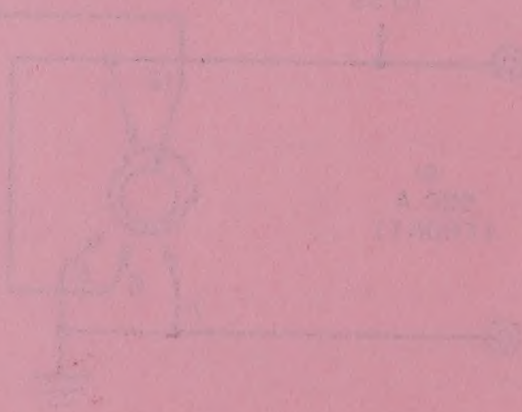
Page 53/54, Figure 12B, change A1S1 to the following:



Model 3135, Serial No. 540 up
Model 3136, Serial No. 323 up

Page 42, change the following to:

A6R1	Res, 150 ohms ±5%, 5 W, wire-wound	560 00004 01	1
A6R2	Res, 510 ohms ±5%, 1/2 W, carbon	502 00511 00	1
A6VR1	Diode, Zener, type 1N2979B	410 00007 01	1



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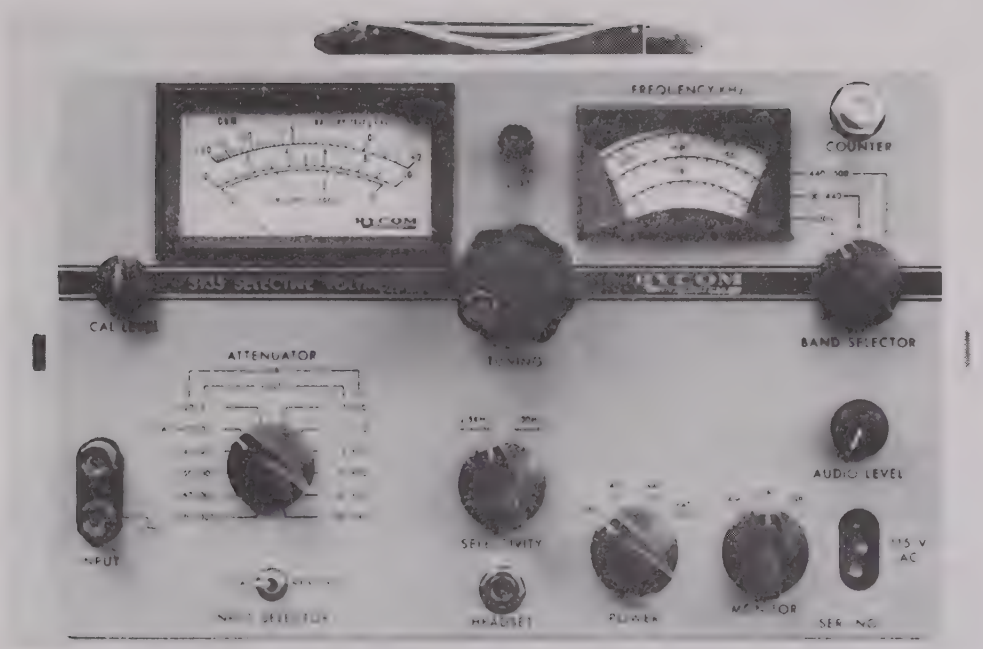


Figure 1. Model 3135 Selective Voltmeter

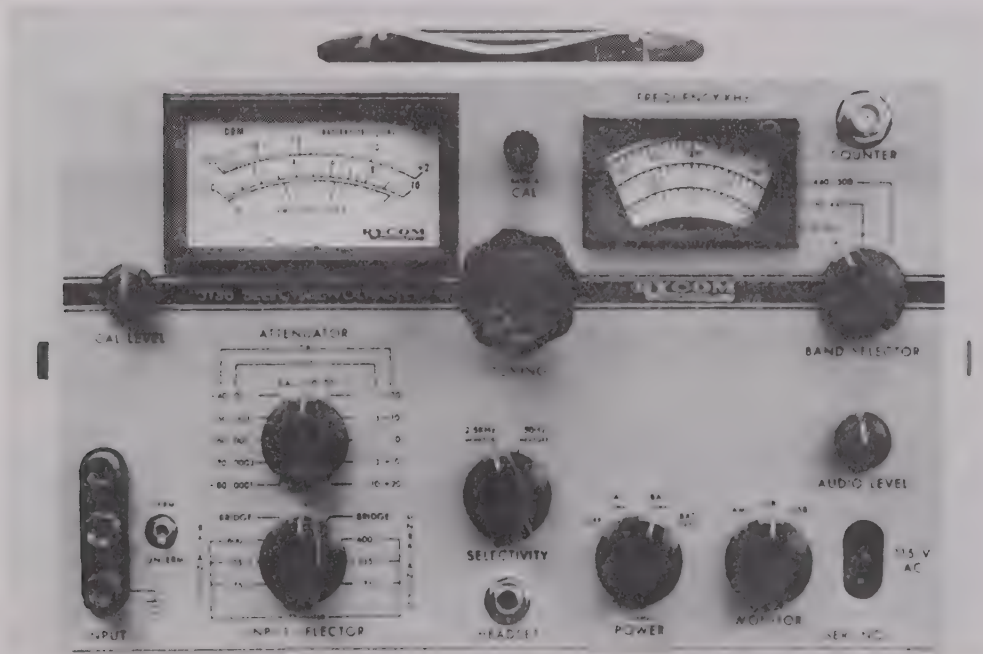


Figure 2. Model 3136 Selective Voltmeter

CHAPTER I
GENERAL

1. SCOPE.

This manual describes the following RYCOM instruments:

Model 3135 Selective Voltmeter
Model 3136 Selective Voltmeter

2. DESCRIPTION.

The instruments are intended for general use where it is desired to measure the level of individual or narrow bands of frequency. Each can be operated from its internal battery, or from 115 volts ac, 50-400 Hz, which is also used to charge the battery.

Table 1 lists the specifications and figures 1 and 2 show the instruments.

The instruments are fully solid state. The Model 3135 will measure signal level from -90 dBm to +42 dBm 600-ohm, and voltage from 24.5 microvolts to 100 volts, and the Model 3136 will measure signal level from -100 dBm to +22 dBm and voltage from 7.75 microvolts to 10 volts, 600-ohm. The instruments have a narrow filter that makes it particularly useful for analyzing closely spaced signals, complex waveforms, determining carrier system levels, and checking amplitude modulation percentages. Included is a wide band filter that can be used for searching and monitoring. Special features include a calibration oscillator, an extended low frequency band for more accurate measurement of the low frequency portion of the tuning range, a speaker, a headphone jack for aural monitoring, and a built-in battery charger.

A compact metal cabinet 8 inches high, 12 inches wide and 9 inches deep houses the instrument. Weight, including the battery is 14 pounds. The front panel contains all the operating controls and is protected by a metal cover that snaps in place. The Power switch must be set to the OFF position before the cover can be installed, thereby preventing the possibility of battery discharge while the instrument is not in use.

Circuitry is mounted on printed circuit boards and assembled into separate modules. Extensive shielding is provided for modules and components to prevent interaction between circuits.

The power switch is used to select either 115 volts, 50-400 Hz, or an internal rechargeable battery as the power source. The battery will operate the instrument approximately 16 hours without recharging. The instrument will operate on the 115-volt ac line source with or without the battery and regardless of battery condition. A polarized three-pin male connector, on the right side of the front panel, provides access for battery charging and operation from the 115-volt ac source. The instrument may be operated while the battery is charging.

Table 1. Specifications

CHARACTERISTIC	SPECIFICATION
FREQUENCY RANGE	1 to 1500 kHz (3 bands) Band A: 1 to 30 kHz Band B: 30 to 440 kHz Band C: 440 to 1500 kHz
SELECTIVITY	
Monitor	2500 Hz nominal between -3 dB points 10,000 Hz maximum between -60 dB points
Measure	50 Hz nominal between -3 dB points 230 Hz maximum between -60 dB points or 100 Hz nominal between -3 dB points 400 Hz maximum between -60 dB points or 250 Hz nominal between -3 dB points 1100 Hz maximum between -60 dB points
FREQUENCY ACCURACY	Dial: Band A ±100 Hz Band B ±2 kHz Band C ±2 kHz Counter: True restored frequency
MEASUREMENT ACCURACY	±1 dB
SPURIOUS RESPONSE AND INTER-MODULATION PRODUCTS	Greater than 55 dB down
INTERNAL CALIBRATION SOURCE	10 and 250-kHz oscillators
TYPES OF DEMODULATION	AM, LSB, and USB
INTERMEDIATE FREQUENCY	2215 kHz
TEMPERATURE RANGE	-10° C to +50° C
POWER SUPPLY	12-volt rechargeable battery or 115 volts, 50 to 400 Hz, for ac operation and for charging battery.
CURRENT DRAIN	63 mA average
BATTERY LIFE	16 hours without recharging
OVERALL DIMENSIONS	8 in. high x 12 in. wide x 9 in. deep
WEIGHT	14 pounds

Table 1. Specifications (cont)

CHARACTERISTIC	SPECIFICATION
INPUT LEVEL	
Model 3135	-90 to +42 dBm 600-ohms (24.5 uV to 100 V)
Model 3136	-100 to +22 dBm (7.75 uV to 10V)
INPUT IMPEDANCE	
Model 3135	Bridge (20 k ohms nominal); unbalanced when operating from 115 V ac
Model 3136	Bridge (4000 ohms nominal); 75-, 135-, 600-ohms or bridge unbalanced 75-, 135-, 600-ohms or bridge balanced
METER INDICATION	
Model 3135	dBm on 75-, 135-, and 600-ohm line; volts when calibrated for 600 ohms.
Model 3136	dBm on 75-, 135-, and 600-ohm line; volts with INPUT SELECTOR switch in 600-ohm or BRIDGE position.

CHAPTER II
OPERATION

1. PREPARATION.

The instrument has been thoroughly inspected at the factory and is covered by Warranty. However; before using the instrument, you should inspect it for shipping damage. Report any damage to the carrier and to RYCOM Instruments, Inc.

2. OPERATING CONTROLS AND INDICATORS.

Table 2 lists and describes the instrument controls and indicators.

Table 2. Operating Controls and Indicators

PANEL MARKING	DESCRIPTION	FUNCTION
BAND SELECTOR	3-position rotary switch	Selects frequency band A, B, or C.
TUNING	Driven tuning mechanism, 2-speed	Tunes instrument to frequency indicated on dial face.
CAL BAND A	Variable capacitor.	Calibrates dial on band A.
No marking	1/4-in. black knob on FREQUENCY dial bezel.	Rotates cursor $\pm 5^{o}$ for frequency correction.
COUNTER	BNC connector	Provision for connection to electronic frequency counter.
SELECTIVITY	2-position rotary switch	Selects bandwidth (measure) or (monitor).
CAL LEVEL	Potentiometer	Adjust overall gain during calibration.
MONITOR	3-position rotary switch	Selects AM or single sideband (LSB, USB) demodulation.
AUDIO LEVEL	Potentiometer	Adjusts audio level for Headset or speaker.
HEADSET	Headphone jack	Provision for audio monitoring.

Table 2. Operating Controls and Indicators (cont)

PANEL MARKING	DESCRIPTION	FUNCTION
ATTENUATOR		
Model 3135	12-position rotary switch	Controls sensitivity in 10-dB steps up to 110 dB.
Model 3136	11-position rotary switch	Controls sensitivity in 10-dB steps up to 100 dB.
INPUT SELECTOR		
Model 3135	2-position toggle switch	Connects input circuits to INPUT binding posts for measurements or to calibrate oscillators for operational calibration.
Model 3136	9-position rotary switch	1. Selects input terminations of BRIDGE, 600-, 135-, or 75-ohm input with TERM-UNTERM switch in TERM position; BALANCED or UNBALANCED. 2. Selects CAL position for operational calibration.
TERM-UNTERM	2-position toggle switch	Removes terminating impedances.
INPUT	Binding posts	Signal input for measurements.
POWER	4-position rotary switch spring loaded in BAT. TEST position	Connects power supply to ac line, battery, or battery test circuit.
115 VAC	Polarized connector	Provision for connection to 115-V ac line.

3. BATTERY.

The battery will provide up to 16 hours of operation between charges. A completely discharged battery will recharge in 24 hours or less. A routine recharging schedule should be established, dependent upon instrument use, but the battery should be charged at least once per month. With continuous ac operation, battery charging is unnecessary.

a. To charge battery, connect instrument to primary source (115 V ac) and set POWER switch to BAT.

b. To test condition of battery while it is delivering full load current, set POWER switch to BAT. TEST. Battery is charged when the meter indicates 0 ±0.5 dBm.

4. CALIBRATION.

This procedure checks the main tuning dial and overall sensitivity.

a. Perform all steps in sequence given.

b. Adjust equipment as follows:

Switch/Control	Position
FREQUENCY dial red cursor	Align with notch in top of FREQUENCY dial bezel opening
INPUT SELECTOR	CAL
SELECTIVITY	MEASURE

C. Band A Calibration

(1) Set ATTENUATOR to CAL -30 DB

(2) Set BAND SELECTOR to A

(3) Adjust TUNING to 10 kHz CAL on FREQUENCY dial

(4) Turn POWER on and allow 5 minutes for warm up.

(5) Slowly adjust CAL BAND A for maximum meter indication

NOTE

Band A has 4 useful frequency dial check points, 0, 10, 20, and 30 kHz. Only the 10 kHz frequency can be used for level calibration. Useful harmonics are available to approximately 240 kHz for checks in the frequency dial calibration. Simply adjust the ATTENUATOR to the left to obtain sufficient sensitivity to calibrate the frequency dial. The INPUT SELECTOR must be in CAL position to make these checks.

d. Band B and C Calibration

(1) Set ATTENUATOR to CAL -30 DB

(2) Set BAND SELECTOR to B

(3) Adjust TUNING TO 250 kHz CAL on FREQUENCY dial

(4) Turn POWER on and allow 5 minutes for warm up.

(5) Slowly adjust TUNING control across the 250 kHz CAL frequency for a maximum meter indication

(6) Carefully align the FREQUENCY dial red cursor with 250 kHz indication on FREQUENCY dial

NOTE

Useful harmonics are available at 500, 750, 1000, 1250, and 1500 kHz for calibrating the frequency dial. Both Band A and Band B calibrate oscillators are on when INPUT SELECTOR switch is in CAL position, thus many frequency dial check points are available. Also, CAL BAND A control will affect bands B and C. So between CAL BAND A control and the FREQUENCY dial red cursor, considerable range is provided for insuring dial accuracy over the entire range of the instrument.

e. Model 3135. To calibrate for dBm (600 ohms) and voltage, perform steps given for Band A and Band B calibration and adjust CAL LEVEL control for 0 dBm meter indication.

f. Model 3135. To calibrate for dBm (135 ohms), perform steps given for Band A and Band B calibration except set ATTENUATOR to -20 DB and adjust CAL LEVEL control for -3.5 dBm meter indication.

g. Model 3135. To calibrate for dBm (75 ohms), perform steps given for Band A and Band B calibration except set ATTENUATOR to -20 DB and adjust CAL LEVEL control for -1 dBm meter indication.

Note: With increased i-f gain, units will become sensitive to the sideband oscillator used for USB or LSB demodulation. To avoid this problem with input greater than -70 dBm, use the following alternate method for 75 ohm calibration:

Perform steps given for Band A and Band B except adjust CAL LEVEL control for -1 dBm meter indication with ATTENUATOR set to -30 DB. Add +10 dBm to all measurements to obtain a correct 75-ohm measurement.

h. Model 3136. To calibrate for dBm (600-, 135-, and 75-ohms) and voltage, perform steps given for Band A and Band B calibration and adjust CAL LEVEL control for 0 dBm meter indication.

5. INPUT SELECTOR SETTING AND METER CORRECTION, MODEL 3136.

a. INPUT SELECTOR on BRIDGE.

(1) Use this position to connect across a 600-ohm line to make dBm measurements when calibrated.

(2) Use this position to connect across any line to make voltage measurements. Calibrate according to paragraph 4.h.

NOTE: Due to loading (4000 ohms at 250 kHz), apply the correction factors listed in table 3 for BRIDGE or (TERM-UNTERM on UNTERM) positions.

b. INPUT SELECTOR on 600 Ohms, (TERM-UNTERM on TERM). Use this position to terminate a 600-ohm line to make dBm (1 mW in 600 ohms) or voltage measurements. Calibrate according to paragraph 4.h.

c. INPUT SELECTOR on 135 Ohms, (TERM-UNTERM on TERM). Use this position to terminate a 135-ohm line to make dBm (1 mW in 135 ohms) measurements. Calibrate according to paragraph 4.h. Use UNTERM position for BRIDGE measurements.

d. INPUT SELECTOR on 75 Ohms, (TERM-UNTERM on TERM). Use this position to terminate a 75-ohm line to make dBm (1 mW in 75 ohms) measurements. Calibrate according to paragraph 4.h. Use UNTERM position for BRIDGE measurements.

Table 3. INPUT SELECTOR Setting and Meter Correction, BRIDGE or UNTERM Position.

INPUT SELECTOR	METER INDICATION	SOURCE OR LINE IMPEDANCE	METER CORRECTION FACTOR
BRIDGE or 600 ohms (UNTERM)	Volts and dBm (600 ohms)	600 Ohms	+1.2 dB
135 Ohms (UNTERM)	dBm (135 ohms)	135 ohms	+0.3 dB
75 Ohms (UNTERM)	dBm (75 ohms)	75 ohms	+0.2 dB

6. LINE MEASUREMENTS, MODEL 3135.

a. To make unbalanced measurements below 500 Hz or balanced measurements, perform the following:

(1) Place the instrument face up (resting on the four rubber feet) and remove the ac line cord from the 115 VAC receptacle. Set POWER switch to BAT. position. This removes all but 100 picofarads of unbalance between ground and the ground terminal of the instrument.

(2) Connect the instrument INPUT jacks to the circuit to be tested.

(3) Calibrate the instrument according to paragraph 4.

(4) Set INPUT SELECTOR switch to MEASURE.

(5) Set BAND SELECTOR switch and adjust TUNING control to frequency of signal to be measured.

(6) Set ATTENUATOR switch so meter indicates in upper 2/3 of scale.

(7) Adjust TUNING control for maximum indication on meter.

(8) Read meter indication in dBm. To obtain the input signal level, algebraically add meter indication to ATTENUATOR switch setting.

b. To make unbalanced measurements above 500 Hz, perform steps (2) thru (8).

7. LINE MEASUREMENTS, MODEL 3136.

a. To make measurements below 500 Hz, perform the following:

(1) Remove the ac line cord from the 115 VAC receptacle to avoid possible spurious responses at 60 Hz harmonics. Set POWER switch to BAT. position.

(2) Connect the instrument INPUT jacks to the circuit to be tested.

(3) Calibrate the instrument according to paragraph 4.

(4) Set INPUT SELECTOR switch to desired impedance. See paragraph 5.

(5) Set BAND SELECTOR switch and adjust TUNING control to frequency of signal to be measured.

(6) Set ATTENUATOR switch so meter indicates in upper 2/3 of scale.

(7) Adjust TUNING control for maximum indication of meter.

(8) Read meter indication in dBm. To obtain the input signal level, algebraically add meter indication to ATTENUATOR switch setting.

b. To make measurements above 500 Hz, perform steps (2) thru (8).

8. MONITORING.

Provision is made for monitoring audio signals that may be present on line signals under measurement. To monitor signals, set SELECTIVITY switch to MONITOR, set MONITOR switch to desired position (AM, LSB, or USB), and adjust AUDIO LEVEL control to the desired audio level.

9. COUNTER OUTPUT.

The counter output is standard equipment and is true restored frequency.

a. Use a short length of coax cable to connect the COUNTER output to the input of a frequency counter with the characteristics:

(1) Sensitivity: 0.1 volt RMS

(2) Input Impedance: 10,000 ohms

b. If the counter has a memory control, turn it on and adjust display time for minimum display time.

c. Varible gate times give the following readout options:

(1) 0.01 seconds = ±100 Hz accuracy

(2) 0.1 seconds = ±10 Hz accuracy

(3) 1.0 seconds = ±1 Hz accuracy

d. The counter should not indicate unless there is a signal present at the COUNTER output jack. There will be a signal present at the COUNTER output jack only when the Voltmeter is tuned to a signal being received and the level of that received signal indicates above -10 on the meter scale. To preset the Voltmeter to a precise frequency, use an external signal source.

CHAPTER III
THEORY OF OPERATION

1. GENERAL.

The instrument employs a single conversion super-heterodyne circuit with a selectable bandpass to measure frequencies in the range of 1 to 1500 kHz. Figure 11 is a functional block diagram for the instrument and figure 12 is the basic schematic diagram without the counter output module. Figures 12a and 12b show the different input circuits of the two models.

At the input of the instrument, a switch is used to select the input signal from the calibrate oscillators or from the front panel INPUT jacks. A low-pass filter and matching network are incorporated into the input circuit to attenuate unwanted high-frequency components and to provide proper impedances.

The variable attenuator will provide up to 110 dB (100 dB on Model 3136) of attenuation in 10 dB steps to control sensitivity of the instrument. Tuning of the instrument is accomplished by a variable local oscillator whose output varies from 2215 to 3715 kHz. The input and local oscillator signals are heterodyned in a mixer to produce a 2215-kHz difference frequency. The i-f amplifier is tuned to 2215 kHz and it amplifies the mixer output.

The selectivity of the instrument is determined by crystal filters between the first and second i-f amplifiers. After amplification by the i-f amplifier, the signal is rectified and filtered in a meter detector circuit and then applied to a meter.

The second detector, when used with the insertion frequency of 2213.5 kHz or 2216.5 kHz will produce single sideband demodulation for audio monitoring.

The calibrate oscillators generate 10- and 250-kHz signals and are amplitude regulated to provide an output level that is equivalent to -30 dBm at the INPUT jacks. Before measurements are made, the instrument sensitivity is calibrated by connecting the calibrate oscillator output to the instrument input circuits and adjusting the i-f amplifier gain for a meter indication of 0 dBm. The 10-kHz calibrate oscillator is used to calibrate Band A and the 250-kHz calibrate oscillator is used to calibrate Bands B and C.

When the instrument is used for power measurements, the variable attenuator is used to change sensitivity in calibrated steps of 10 dB. For example, assume that a signal level of -42 dBm is applied to the instrument input. Adjusting the attenuator to the -40 dB position will result in meter indication of -2 dBm. The input level is then determined by algebraically adding the meter indication to the attenuator setting;

$$-40 \text{ dB} + (-2 \text{ dBm}) = -42 \text{ dBm}$$

2. INPUT ASSEMBLY A1 - Model 3135.

The input circuits are composed of INPUT SELECTOR switch A1S1 and a 110-dB ATTENUATOR switch A1AT1. Input signals are applied to INPUT binding posts A1E1 and A1E2. The input impedance is 20,000 ohms.

3. INPUT ASSEMBLY A1 - Model 3136.

The input circuits are composed of INPUT SELECTOR switch A1S1, TERM-UNTERM switch A1S3 and a 100-dB ATTENUATOR assembly A1AT1. Input signals are applied to INPUT binding posts A1E1 and A1E2. The input bridging impedance is 4000 ohms at 250 kHz.

Resistor A1R1, A1R2, or A1R3 is switched into the circuit by A1S1 to terminate 75-, 135-, or 600-ohm lines. Resistors A1R20 and A1R22 form a -2.5 dB L-pad, and are switched into the circuit in INPUT SELECTOR position 135 ohm for measurements on 135-ohm impedance lines. Resistors A1R21 and A1R23 form a -9.0 dB L-pad, and are switched into the circuit in INPUT SELECTOR position 600 ohm for measurements on 600-ohm impedance lines. This allows one calibration to serve for 75-ohm, 135-ohm and 600-ohm dBm measurements.

4. VOLTAGE-FOLLOWER AND CALIBRATE OSCILLATOR ASSEMBLY A2.

The function of the voltage-follower is to match attenuator A1AT1 to lowpass filter FL3.

The calibration section contains two oscillators, 10 and 250 kHz. The 250 kHz oscillator is crystal controlled, consisting of A1Q4, A1Y1 and associated components. A1R10 adjusts the level of the 250 kHz calibration signal. A1Q5, A2Q6 A2L2 and A2C9 form a 10 kHz self excited oscillator. A2CR1 provides temperature stabilization and A2R21 adjusts the level of the 10 kHz calibration signal. The output from pin 4 of the A2 Assembly goes to the INPUT SELECTOR switch S1.

5. LOWPASS FILTER FL3.

The lowpass filter has a cutoff frequency of 1550 kHz and provides 70 dB of attenuation at 2215 kHz. Input and output impedances are 150 ohms.

6. OSCILLATOR-MODULATOR ASSEMBLY A3.

The input signal is heterodyned with the local oscillator injection signal in balanced modulator diodes A3CR1. The diodes operate as a balanced shunt modulator, shorting the signal to ground during one-half the local oscillator cycle. The 2215-kHz output of the modulator is capacitively coupled to the base of first i-f amplifier A4Q1.

The modulator driver A3Q1 output is transformer-coupled through A3T1 to the modulator diodes. Local oscillator level at the junction of the modulator diodes is very small due to the matching of components. Input to the modulator driver is capacitively coupled from the emitter of local oscillator A3Q2.

The local oscillator is a modified Colpitts type with three switched frequency bands. The frequency in each band is varied by adjusting TUNING capacitor C1, an 11 - 150 picofarad air-dielectric capacitor. The oscillator circuit is temperature-stabilized by A3C8.

7. I-F AMPLIFIER ASSEMBLY A4.

The 2215-kHz output of the modulator is capacitively coupled to first i-f amplifier A4Q1. The amplifier and filter driver consists of three stages:

A4Q1, A4Q2, and A4Q3. Total gain is 36 dB. Output of A4Q2 is transformer coupled to A4Q3, the filter driver.

The instrument has two crystal filters which are selected by the SELECTIVITY switch A4S4. The center frequency of both filters A4FL1 and A4FL2 is nominally 2215 kHz. Trimmer capacitors A4C7 through A4C10 tune the filters for maximum flatness. Each filter has an input impedance of 4000 ohms and an output impedance of 1000 ohms.

The filter matching amplifier and second i-f amplifier consists of three stages: A4Q4, A4Q5, and A4Q6. Output of the crystal filter is capacitively coupled to filter matching amplifier A4Q4-A4Q5. CAL LEVEL control R2 is used to adjust bias current for A4Q5, thus controlling gain of the stage. The output of A4Q5 drives common-emitter amplifier A4Q6. Second i-f amplifier A4Q6 has a gain of 20 to 40 dB, depending upon the setting of CAL LEVEL control R2.

Third i-f amplifier A4Q7 provides 30 dB of gain and is transformer-coupled to i-f output amplifier A4Q8. Output of A4Q7 is also capacitively coupled to the meter detector circuit.

Meter detector diode A4CR1 is a half-wave detector with its output applied through A4R27 to power switch S7, which is connected to the meter.

I-f output amplifier A4Q8 provides isolation of the carrier reinsertion oscillator signal and also drives demodulator diodes A5CR2 and A5CR3.

8. MONITOR ASSEMBLY A5.

The AM demodulator is a shunt type, A5CR2 is the diode. MONITOR switch A5S5, when in the AM position, connects the cathode of A5CR2 to ground. R-f filtering is done by A5C8 and A5R12. The audio signal is capacitively coupled from AUDIO LEVEL control R1 to the input of audio amplifier A5I2.

The sideband demodulator consists of A5CR1 and A5CR2, which are supplied with carrier signal from A5Q2. These diodes operate as a balanced shunt demodulator that shorts the i-f signal to ground during one-half the injection signal cycle. This produces an audio difference signal that is coupled to the audio amplifier A5I2. The difference signal is approximately 1.5 kHz.

Carrier reinsertion oscillator A5Q1 is crystal-controlled by A5Y1 or A5Y2. Output is coupled to balanced phase splitter A5Q2, which supplies out-of-phase signals to demodulator diodes A4CR1 and A5CR2. MONITOR switch A5S5 is used to apply power to A5Q1 and A5Q2, and select the crystal for LSB or USB demodulation. LSB crystal A5Y2 is 1.5 kHz below and USB crystal A5Y1 is 1.5 kHz above the i-f center of 2215 kHz.

9. AUDIO AMPLIFIER ASSEMBLY A5.

The audio amplifier is composed of A5I2a and A5I2b, an integrated circuit. The output of the demodulator is fed through r-f decoupling network A5R12 and A5C8 to AUDIO LEVEL control R1. Signal at the arm of R1 drives the bridge audio amplifier A5I2. Voltage gain of the audio amplifier is approximately 50 dB which gives 256 mW output to the 100 ohm speaker LS1.

10. REGULATOR ASSEMBLY A5.

The regulator consists of a 5 volt, three terminal regulator A4I1 and a 4.3 volt reference diode. The regulator output voltage will nominally be 9.3 volts.

11. AC POWER SUPPLY AND CHARGER ASSEMBLY A6.

The ac power supply consists of T1, A6CR1, A6C1, A6R1, and A6VR1. Voltage applied to the regulator and to the audio amplifiers on assembly A5 is pre-regulated by A6VR1. The ac power supply also supplies charging current of approximately 65 milliamperes to the battery when POWER switch S7 is in the BAT. position. When the POWER switch is in the AC position, A6R2 is connected in series with the battery to supply a trickle charge of approximately 5 milliamperes and isolate the battery from the pre-regulated line.

12. COUNTER OUTPUT ASSEMBLY A7.

The purpose of the counter output is to provide an output signal that is exactly equal in frequency to that of the input signal being measured.

Figure 13 is the schematic diagram of the counter assembly. A signal from local oscillator, assembly A3 is connected through a coaxial cable to A7E1. The signal goes through isolation amplifiers A7Q1 and A7Q2 to pin 1 of product detector A7I1. The i-f signal comes in on A7E5 to amplifier A7Q5. The output of A5Q5 is coupled to pin 2 of A7I1.

The output at pin 6 of A7I1 is the product of the local oscillator and i-f signals. This output is applied to lowpass filter consisting of A7L2, A7L3, A7C5 through A7C9. The cut-off frequency is approximately 1500 kHz. The output from the filter is amplified by A7Q3 and A7Q4 and coupled to COUNTER jack J3 on the front panel of the instrument.

CHAPTER IV
MAINTENANCE

1. INTRODUCTION.

This instrument will give comparatively trouble-free performance provided normal operating procedures are observed. In the event of any malfunction, first check the battery by turning the POWER switch to the BAT./TEST position and observing the meter for an indication of 0 ±0.5 dB.

Before attempting to trouble shoot the instrument, you should study Chapter III, Theory of Operation. The trouble-shooting procedure consists of three parts:

Isolation to a particular assembly
Assembly trouble shooting
Transistor voltage checks

2. TEST EQUIPMENT.

The test equipment of table 4 is required to test and align the instrument, but it is not supplied.

Table 4. Test Equipment

NAME	USE	REQUIRED CHARACTERISTICS
Sweep Generator and Display Unit	Align i-f amplifiers and crystal filters	1. Center frequency between 50 and 500 kHz 2. Sweep width variable from 5 to 40 kHz 3. Sweep rate: 1/sec. to 4/sec.
Vtvm		Triplett 850 or equivalent
Frequency Counter		1. Minimum counting rate 3000 kHz 2. Gate time 1 sec. and 0.01 sec. 3. Variable display time
Signal Generator		Hewlett-Packard 651 or equivalent
AC Vtvm		Ballantine 303 or equivalent

3. TROUBLE SHOOTING.

Before proceeding with step 1 in table 5, connect equipment in the test setup shown in figure 3 and perform the following steps:

a. Power the instrument from 115 V ac line power and set instrument switches and controls as follows:

Switch/Control	Position
INPUT SELECTOR	MEASURE (Model 3135) BRIDGE (Model 3136)
BAND SELECTOR	B
TUNING	250 kHz
ATTENUATOR	-60 dB
CAL LEVEL	Fully clockwise
SELECTIVITY	MONITOR
POWER	BAT.

b. Adjust signal generator for 0.78 V, 250-kHz output signal.

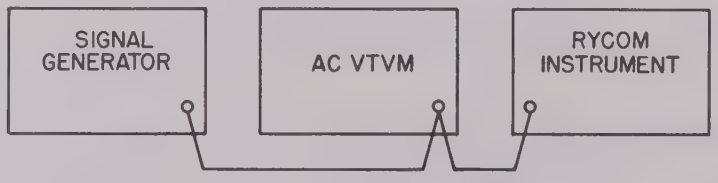


Figure 3
Test Setup for Assembly Isolation

Table 5. Assembly Isolation

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1	Turn unit on. Activate BAT. TEST.	Meter reads 0 ±0.5 dB.	Battery needs recharge or trouble is in power supply regulator Assembly A5. See table 6.
2	Connect ac vtvm to pin 7 of Assembly A2.	Ac vtvm indicates 77 mV on Model 3135 (26 mV on Model 3136).	Trouble is in input Assembly A1. See table 8.
3	Set INPUT SELECTOR to CAL. Connect ac vtvm to pin 7 on Assembly A2.	Ac vtvm indicates 2.4 mV on Model 3135 (1 mV on Model 3136).	Trouble is in calibrate oscillator on Assembly A2. See table 10.

Table 5. Assembly Isolation (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
4	Set INPUT SELECTOR per 3.a. Connect ac vtvm to pin 1 on Assembly A2.	Ac vtvm indicates 34 mV on Model 3135 (11.7 mV on 3136).	Trouble is in emitter-follower on Assembly A2. See table 9.
5	Connect ac vtvm to E2 on Assembly A4.	Ac vtvm indicates 30 mV on Model 3135 (9.2 mV on Model 3136).	Trouble is in FL3 lowpass filter. See table 11.
6	Set BAND SELECTOR to A. Tune dial to zero frequency.	Instrument meter indicates past full scale.	Trouble is in Assembly A3. See table 12.
7	Set ATTENUATOR to 0 dB. Tune dial to 250 kHz and adjust CAL LEVEL to obtain a 0 dB meter indication. Connect ac vtvm to E6 on Assembly A4.	Ac vtvm indicates .15 V.	Trouble is in Assembly A4. See table 13.
8	Connect ac vtvm to E10 on Assembly A5. Set MONITOR to LSB; AUDIO LEVEL fully CCW.	Ac vtvm indicates .05 V.	Trouble is in reinsertion oscillator Assembly A5. See table 14.
9	Set AUDIO LEVEL TO 6 o'clock. Connect ac vtvm to chassis gnd and each side of speaker.	Ac vtvm indicates approx. .25 V.	Trouble is in audio amplifier Assembly A5. See table 15.

Table 6. Regulator Assembly A5 Trouble Shooting

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1	Connect vtvm to E1 on Assembly A5. Remove ac power cord.	Vtvm indicates 11.5 to 13.5 V dc.	Check battery connections. Battery needs recharging.
2	Connect vtvm to E1 on Assembly A5. Connect ac power cord. Remove lead from terminal on battery.	Vtvm indicates 13.5 to 16.5 V dc.	Check charging circuit. See table 7.

Table 6. Regulator Assembly A5 Trouble Shooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
3	Connect battery lead to battery. Connect vtvm to E6 on Assembly A5.	Vtvm indicates approx. 9.0 V dc.	Check A5I1 voltages. See table 17.

Table 7. Power Supply and Charging Circuit Assembly A6 Trouble Shooting

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1	Connect vtvm to cathode of A6VR1. Set POWER to AC.	Vtvm indicates 13.5 to 16.5 V dc.	Check A6CR1, A6C1, A6R1 and A6VR1. Check switch S7.

Table 8. Input Assembly A1 Trouble Shooting

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1	Set INPUT SELECTOR per 3.a. Connect ac vtvm to coaxial lead from S1 to AT1 on Assembly A1. Set ATTENUATOR to -70 dB on Model 3135 (-80 dB on Model 3136).	Ac vtvm indicates .78 V on Model 3135 (0.27 V on Model 3136).	Check A1C1 and switch A1S1 connections for continuity.
2	Connect ac vtvm pin 7 on Assembly A2.	Ac vtvm indicates .246 V on Model 3135 (0.27 V on Model 3136).	Check AT1 for bad components and poor switch contact.

Table 9. Voltage-Follower Assembly A2 Trouble Shooting

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1	Set signal generator terminated by 50 ohm load to 250 kHz at -30 dBm and connect to pin 7 of Assembly A2. Connect ac vtvm to pin 1.	Ac vtvm indicates 11 mV.	Check A2Q1, A2Q3, and A2Q4 voltages. See table 16.

Table 10. Calibrate Oscillator Assembly A2 Trouble Shooting

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1	Set INPUT SELECTOR to CAL. Connect ac vtvm to pin 4 on Assembly A2.	Ac vtvm indicates 37 mV.	Check A2Q4, A2Q5 and A2Q6 voltages. See table 16.

Table 11. Lowpass Filter FL3 Trouble Shooting

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1	Set signal generator to 250 kHz at 24.5 mV and connect to IN on FL3. Connect ac vtvm to OUT on FL3.	Ac vtvm indicates 25 mV.	Check continuity of FL3.
2	Connect ohmmeter from pin IN to OUT on FL3.	Ohmmeter indicates 1 ohm.	Trouble is in FL3.

Table 12. Local Oscillator Assembly A3 Trouble Shooting

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1	Connect ac vtvm to junction of A3R1 and A3CR1.	Ac vtvm indicates .8 V.	Check A3Q1 and A3Q2 voltages. See table 16.
2	Connect ac vtvm to junction of A3R5 and A3R6.	Ac vtvm indicates between 0.15 and 0.4 V.	Check A3Q2 voltages. See table 16.

Table 13. I-f Amplifier Assembly A4 Trouble Shooting

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1	Set signal generator to 2215 kHz at -120 dB .775 uV and connect to A4E2. Rotate CAL LEVEL full cw. Set SELECTIVITY to MONITOR.	Instrument indicates between -8 and -2 dB.	Adjust A4T1, A4T2, and A4T3 for maximum indication on meter. Check A4Q1 thru A4Q8 voltages. See table 16.

Table 14. Reinsertion Oscillator Assembly A5 Trouble Shooting

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1	Set MONITOR to LSB. Connect ac vtvm to drain of A5Q1.	Ac vtvm indicates 2.2 V.	Check A5Q1 voltages. See table 16. Check Crystals.
2	Connect ac vtvm to collector of A5Q2.	Ac vtvm indicates .7 V.	Check A5Q2 voltages. See table 16.

Table 15. Audio Amplifier Assembly A5 Trouble Shooting

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1	Set signal generator to 1 kHz at 11 mV and connect to E10 on Assembly A5. Rotate AUDIO LEVEL control R1 fully cw. Connect ac vtvm to chassis gnd and each side of speaker.	Ac vtvm indicates greater than 1.7 V.	Check A5I2 voltages. See table 17.

Table 16. Transistor Voltage Chart

Set instrument controls:

1. No signal input
2. CAL LEVEL fully cw
3. MONITOR to LSB
4. INPUT SELECTOR to CAL

Readings taken with vtvm and should be ±10%.
All voltages positive with respect to chassis ground.

MODULE	TRANSISTOR	EMITTER	BASE	COLLECTOR
A2	Q2	8.0	7.4	1.8
	Q3	1.2	1.8	8.2
	Q4	2.2	2.0	5.8
	Q5	6.2	7.0	0
	Q1	Source = 1.2	Gate = 0	Drain = 7.4
	Q6	Source = 1.8	Gate = 0	Drain = 8.4
A3	Q1	1.6	2.2	6.2
	Q2	1.4	1.9	7.7
A4	Q1	2.8	3.4	8.2
	Q2	2.1	2.8	8.2
	Q3	1.1	1.7	4.1
	Q4	1.8	2.4	8.6
	Q5	1.1	1.8	4.3
	Q6	2.2	2.8	9.0
	Q7	0.8	1.5	8.8
	Q8	1.5	2.2	5.0
A5	Q1	Source = 0.8	Gate = 0	Drain = 5.3
	Q2	7.5	7.1	1.5
A7	Q1	.9	1.5	8.7
	Q2	0.3	.9	8.7
	Q3	0.4	1.0	6.0
	Q4	5.4	6.0	8.1
	Q5	.6	1.2	4.3

Table 17. Integrated Circuit Voltages

Test conditions are same as those given in table 16.									
INTEGRATED CIRCUIT	PINS 1	2	3	6	7	8	9	13	14
A5I1	13.5	9.0	4.0	N/A	N/A	N/A	N/A	N/A	N/A
A5I2	6.8	6.7	0	6.8	6.8	6.8	6.8	6.7	13.5
	Note: A5I2 pins 3, 4, 5, 10, 11 and 12 = 0								
INTEGRATED CIRCUIT	PINS 1	2	3	4	5	6	7	8	
A7I1	3.8	1.3	0	.5	3.8	8.3	3.8	8.7	

4. ALIGNMENT.

a. Calibrate Oscillator. Due to normal aging, or replacement of parts, it may be necessary to calibrate the voltmeter. This is accomplished by comparing the calibrate oscillator output level with a known external source. Connect the equipment as shown in figure 4, then proceed with steps (1) through (17).

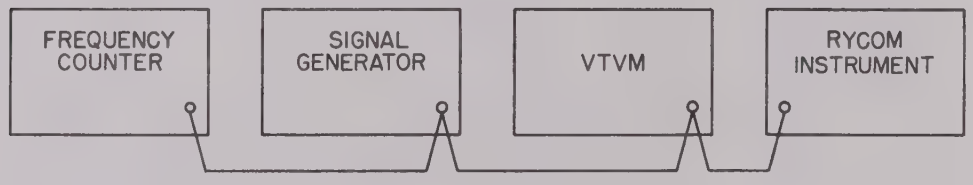


Figure 4
Test Setup for Level Calibration

(1) Set instrument switches and controls as follows:

Switch/Control	Position
INPUT SELECTOR	MEASURE (Model 3135) BRIDGE (Model 3136)
SELECTIVITY	MEASURE
ATTENUATOR	CAL -30 dB

(2) Set BAND SELECTOR switch to B.

(3) Adjust TUNING control to 250 kHz CAL indication on FREQUENCY dial.

(4) Adjust signal generator frequency to 250 kHz.

(5) Adjust signal generator output level to -30 dBm (24.5 mV).

(6) Adjust TUNING control for maximum indication on meter.

(7) Adjust CAL LEVEL for 0 dBm indication on meter.

(8) Set INPUT SELECTOR to CAL.

(9) Adjust TUNING control for maximum indication on meter.

(10) Adjust BAND B 250 kHz control on Assembly A2 for 0 dBm indication on meter.

(11) Set BAND SELECTOR switch to A.

(12) Adjust TUNING control to 10 kHz CAL indication on FREQUENCY dial.

(13) Adjust signal generator to 10 kHz.

(14) Repeat steps (5) through (9).

(15) Adjust BAND A 10 kHz control on Assembly A2 for 0 dBm indication on meter.

(16) Disconnect the frequency counter from the signal generator and connect to the COUNTER jack on the front panel, using a short length of coaxial cable.

(17) The frequency should be 10,000 Hz ±50 Hz. If not, remove the cover from the A2 Assembly. Use a short tuning tool to carefully adjust A2L2 for 10,000 Hz ±5 Hz. Replace A2 cover.

b. I-f Amplifier. The alignment of the 2215-kHz i-f amplifier, Assembly A4, is performed by using the internal 250-kHz calibrate oscillator as a signal source. Proceed as follows:

(1) Set the instrument switches and controls as follows:

Switch/Control	Position
INPUT SELECTOR	CAL
ATTENUATOR	CAL -30 dB
SELECTIVITY	MEASURE
BAND SELECTOR	B
TUNING	Adjust for maximum meter indication

NOTE

Assembly A4 cover must be in place before aligning.

(2) Adjust CAL LEVEL (and A4R5 if needed) so meter indicates in upper one-half of scale.

(3) Adjust A4T1, A4T2, and A4T3 with a non-metallic tuning tool for maximum meter indication.

(4) Adjust CAL LEVEL fully counter-clockwise (minimum gain), then adjust A4R5 for -2 dB meter indication on Model 3135 (-9 dB meter indication on Model 3136).

(5) Check gain range by rotating CAL LEVEL to extreme clockwise position (maximum gain). Meter should indicate approximately +1.5 dB on Model 3135 (-4 dB on Model 3136) with ATTENUATOR switch set to -20 dB.

c. Crystal Filters A4FL1 and A4FL2. Crystal filters A4FL1 and A4FL2 on Assembly A4 can be adjusted for passband flatness by using the internal calibrate oscillator. Proceed as follows:

(1) Set the instrument switches and controls as follows:

Switch/Control	Position
INPUT SELECTOR	CAL
ATTENUATOR	CAL -30 dB
SELECTIVITY	MONITOR
BAND SELECTOR	B
TUNING	250 kHz CAL on FREQUENCY dial

(2) Adjust TUNING so meter indicates in valley of passband ripple.

(3) Adjust A4C9 and A4C10 for maximum meter indication.

(4) Repeat steps (2) and (3) until filter A4FL2 passband ripple is within ±0.5 dB.

(5) Set SELECTIVITY to MEASURE.

(6) Adjust TUNING for maximum meter indication.

(7) Adjust A4C7 and A4C8 for maximum meter indication.

(8) Repeat steps (6) and (7) until A4FL1 filter has a rounded peak response with no ripple.

d. Local Oscillator.

(1) Connect equipment as shown in figure 5.

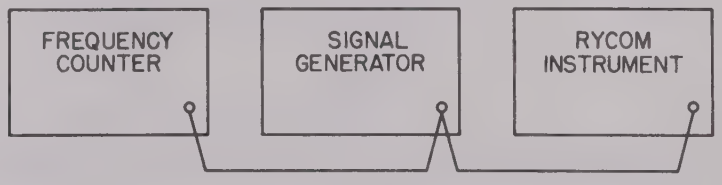


Figure 5. Test Setup for Frequency Alignment

(2) Adjust equipment as follows:

Switch/Control	Position
Signal Generator	0 dBm level output
INPUT SELECTOR	MEASURE (Model 3135) BRIDGE (Model 3136)
ATTENUATOR	0 dB
SELECTIVITY	MEASURE
FREQUENCY dial red cursor	Align with notch in top of FREQUENCY dial bezel opening.

(3) Band C Alignment

(a) Set BAND SELECTOR to C.

(b) Adjust signal generator frequency to 1400 kHz.

(c) Adjust TUNING for 1400 kHz indication on FREQUENCY dial.

(d) Adjust A3C10 for maximum meter indication.

(e) Adjust signal generator frequency to 450 kHz.

(f) Adjust TUNING for 450 kHz indication on FREQUENCY dial.

(g) Adjust A3L3 for maximum meter indication.

(h) Repeat steps (b) through (g) until FREQUENCY dial tracks within ±1 kHz on band C.

(4) Band B Alignment

(a) Set BAND SELECTOR to B.

(b) Adjust signal generator frequency to 450 kHz.

(c) Adjust TUNING for 450 kHz indication on FREQUENCY dial.

(d) Adjust A3C12 for maximum meter indication.

(e) Adjust signal generator frequency to 50 kHz.

(f) Adjust TUNING for 50 kHz indication on FREQUENCY dial.

(g) Adjust A3L3 for maximum meter indication.

(h) Repeat steps (b) through (d) until FREQUENCY dial tracks within ±1 kHz on high end and ±2 kHz on low end.

(i) Repeat steps (a) through (d) of band C alignment. High end should be ±1 kHz and low end ±2 kHz.

(5) Band A Alignment

(a) Set BAND SELECTOR to A.

(b) Adjust signal generator frequency to 35 kHz.

(c) Adjust TUNING for 35 kHz indication on FREQUENCY dial.

(d) Adjust A3C14 for maximum meter indication.

(e) Set signal generator frequency to 1 kHz.

(f) Adjust TUNING for 1 kHz indication on FREQUENCY dial.

(g) Adjust A3C16 for maximum meter indication.

(h) Repeat steps (b) through (g). High and low end should be ±100 Hz.

CHAPTER V
PARTS LIST

1. HOW TO ORDER PARTS.

When ordering parts, always include:

a. Name, Model and Serial Number of the instrument.
b. Assembly and reference designation.
c. Part number.
d. Description.

Order parts from:

RYCOM INSTRUMENTS INC.
9351 East 59th Street
Raytown, Missouri 64133 Telephone 816-353-2100

REF DES	DESCRIPTION	RYCOM NO.	QTY/ ASSY
	PARTS LOCATED ON FRONT PANEL OR CHASSIS		
BT1	Battery, 12 Volt, rechargeable	770 00001 00	1
C1	Cap, var, air, 11-150 pF, type L	650 00002 02	1
C2	Cap, var, air, 2.7-19.6 pF	650 00001 00	1
FL3	Filter, lowpass, 1.55 MHz cutoff frequency, 150 ohms input and output impedance	761 00005 00	1
J1	Connector, electrical power	812 00027 00	1
J2	Jack, headset	812 00009 00	1
J3	Connector, BNC	812 00062 00	1
L1	Coil, rf, 15.6 uH	701 00008 00	1
L2	Suppressor, parasitic	701 00005 00	1
L3	Suppressor, parasitic	701 00013 00	1
LS1	Loudspeaker	743 00002 00	1
M1	Multimeter, replacement, 0-200 uA, 500 ohms dc resistance	740 00010 00	1
R1	Res, var, 25 k ±20%, 1/2 W	540 00001 15	1
R2	Res, var, 10 k ±20%, 1/2 W	540 00001 10	1
R3	Res, 47 ohms ±5%, 1/2 W, carbon	502 00470 00	1
S7	Switch, rotary, 3-pole, 4-pos, 1-deck	720 00015 00	1
T1	Transformer, power	700 00005 00	1
WA1	Cord Assy, power	151 00011 00	1

PARTS LIST

REF DES	DESCRIPTION	RYCOM NO.	QTY/ ASSY
	INPUT ASSEMBLY A1 (Model 3135)		
A1C1	Cap, 0.47 uF ±20%, 200 wvdc, mylar	620 00025 01	1
A1C2	Cap, 0.22 uF ±20%, 12 wvdc, disc ceramic	600 00007 07	1
A1E1	Binding Post, red	812 00038 00	1
A1E2	Binding Post, black	812 00038 01	1
	Mounting Plate	825 00025 00	1
A1R1	Res, 13.7 k ohms ±1%, 1/4 W, 70° C, film	511 41372 00	1
A1R2	Res, 6340 ohms ±1%, 1/4 W, 70° C, film	511 46341 00	1
A1R3	Res, 18.2 k ohms ±1%, 1/4 W, 70° C, film	511 41822 00	1
A1R4	Res, 2000 ohms ±1%, 1/4 W, 70° C, film	511 42001 00	1
A1R5	Res, 19.6 k ohms ±1%, 1/4 W, 70° C, film	511 41962 00	1
A1R6	Res, 634 ohms ±1%, 1/4 W, 70° C, film	511 46340 00	1
A1R7	Res, 20 k ohms ±1%, 1/4 W, 70° C, film	511 42002 00	4
A1R8	Res, 200 ohms ±1%, 1/4 W, 70° C, film	511 42000 00	1
A1R9	Res, 20 k ohms, same as A1R7		
A1R10	Res, 63.4 ohms ±1%, 1/4 W, 70° C, film	511 46348 00	1
A1R11	Res, 20 k ohms, same as A1R7		
A1R12	Res, 20 ohms ±1%, 1/4 W, 70° C, film	511 42008 00	2
A1R13	Res, 20 k ohms, same as A1R7		
A1R14	Res, 20 ohms, same as A1R12		
A1S1	Switch, toggle	722 00001 00	1
A1S2	Switch, rotary	720 00024 00	1

PARTS LIST

REF DES	DESCRIPTION	RYCOM NO.	QTY/ ASSY
	INPUT ASSEMBLY A1 (Model 3136)		
A1C1	Cap, 10 uF ±10%, 200 wvdc, mylar	620 00023 01	1
A1C2	Cap, 0.1 uF (+80%, -20%), 25 wvdc, ceramic	600 00006 12	1
A1E1	Binding Post, red	812 00038 00	2
A1E2	Binding Post, same as A1E1		
A1E3	Binding Post, black	812 00038 01	1
	Mounting Plate	825 00023 00	1
A1R1	Res, 75 ohms ±5%, 2W, metal film	561 00002 00	1
A1R2	Res, 140 ohms ±2%, 1 W, 125° C, film	561 00001 00	1
A1R3	Res, 681 ohms ±1%, 1/2 W, 70° C, film	511 56810 00	1
A1R4	NOT USED		
A1R5	NOT USED		
A1R6	NOT USED		
A1R7	Res, 6040 ohms ±1%, 1/10 W, 125° C, film	511 36041 00	1
A1R8	Res, 3400 ohms ±1%, 1/10 W, 125° C, film	511 33401 00	1
A1R9	Res, 1580 ohms ±1%, 1/10 W, 125° C, film	511 31581 00	1
A1R10	Res, 4530 ohms ±1%, 1/10 W, 125° C, film	511 34531 00	1
A1R11	Res, 499 ohms ±1%, 1/10 W, 125° C, film	511 34990 00	1
A1R12	Res, 4990 ohms ±1%, 1/10 W, 125° C, film	511 34991 00	3
A1R13	Res, 4870 ohms ±1%, 1/10 W, 125° C, film	511 34871 00	1
A1R14	Res, 158 ohms ±1%, 1/10 W, 125° C, film	511 31580 00	1
A1R15	Res, 4990 ohms, same as A1R12		
A1R16	Res, 49.9 ohms ±1%, 1/10 W, 125° C, film	511 34998 00	1
A1R17	Res, 4990 ohms, same as A1R12		
A1R18	Res, 15.8 ohms ±1%, 1/10 W, 125° C, film	511 31588 00	2
A1R19	Res, 15.8 ohms, same as A1R18		
A1R20	Res, 1300 ohms ±1%, 1/10 W, 125° C, film	511 31301 00	1
A1R21	Res, 3240 ohms ±1%, 1/10 W, 125° C, film	511 33241 00	1
A1R22	Res, 15 k ohms ±1%, 1/10 W, 125° C, film	511 31502 00	1
A1R23	Res, 2740 ohms ±1%, 1/10 W, 125° C, film	511 32741 00	1
A1S1	Switch, rotary, 4-pole, 9-pos, 4-deck	720 00030 00	1
A1S2	Switch, rotary, 4-pole, 11-pos, 4-deck	720 00022 00	1
A1S3	Switch, toggle, dpdt	722 00001 00	1
A1T1	Transformer, input, 1:1 turns ratio, 9.0 ohms ±10% dc resistance	700 00013 01	1

PARTS LIST

REF DES	DESCRIPTION	RYCOM NO.	QTY/ ASSY
	CAL-OSC ASSEMBLY A2		
A2	Circuit Card Assembly, Calibrate Osc. (3135)	110 00028 00	
A2	Circuit Card Assembly, Calibrate Osc. (3136) See figure 6 for component location	110 00028 01	
A2C1	Cap, 15 pF ±5%, 100 wvdc, silver mica	610 00015 21	1
A2C2	Cap, 10 uF ±20%, 10 wvdc, tantalum	640 00001 00	3
A2C3	Cap, 10 uF, same as A2C2		
A2C4	Cap, 0.1 uF ±20%, 100 wvdc, disc ceramic	600 00013 00	3
A2C5	Cap, 470 pF ±5%, 100 wvdc, silver mica	610 20470 21	1
A2C6	Cap, 0.1 uF, same as A2C4		
A2C7	Cap, 250 pF ±5%, 100 wvdc, silver mica	610 20250 21	1
A2C8	Cap, 10 uF, same as A2C2		
A2C9	Cap, 0.1 uF ±5%, 100 wvdc, polypropylene	620 00015 18	1
A2C10	Cap, 0.1 uF, same as A2C4		
A2CR1	Diode, silicon, type 1N914	410 00014 00	3
A2CR2	Diode, same as A2CR1		
A2CR3	Diode, same as A2CR1		
A2L1	Coil, rf, 1.0 mH	701 00032 04	1
A2L2	Coil, var, 253 mH	701 00009 00	1
A2Q1	Transistor, silicon, N-channel, FET, selected 2N5484	400 00001 01	2
A2Q2	Transistor, silicon, PNP, type 2N4058	400 00017 00	1
A2Q3	Transistor, silicon, NPN, selected 2N3710	400 00002 01	2
A2Q4	Transistor, same as A2Q3		
A2Q5	Transistor, silicon, PNP, type 2N5087	400 00021 00	1
A2Q6	Transistor, same as A2Q1		
A2R1	Res, 10 k ohms ±5%, 1/4 W, carbon	500 00103 00	1
A2R2	Res, 1 megohm ±5%, 1/4 W, carbon	500 00105 00	1
A2R3	Res, 1500 ohms ±5%, 1/4 W, carbon	500 00152 00	1
A2R4	Res, 390 ohms ±5%, 1/4 W, carbon	500 00391 00	1
A2R5	Res, 100 ohms ±5%, 1/4 W, carbon	500 00101 00	1
A2R6	Res, 1100 ohms ±5%, 1/4 W, carbon	500 00112 00	1
A2R7	Res, 150 ohms ±5%, 1/4 W, carbon	500 00151 00	1
A2R8	Res, 3320 ohms ±1%, 1/10 W, film	511 23321 10	1
A2R9	Res, 121 k ohms ±1%, 1/10 W, film	511 21213 10	1
A2R10	Res, var, 50 k ohms ±20%, 1/2 W	542 00010 02	1
A2R11	Res, 2260 ohms ±1%, 1/10 W, film Used on Circuit Card Assembly 110 00028 00	511 22261 10	3
A2R11	Res, 2740 ohms ±1%, 1/10 W, film Used on Circuit Card Assembly 110 00028 01	511 22741 10	1

REF DES	DESCRIPTION	RYCOM NO.	QTY/ ASSY
	CAL-OSC ASSEMBLY A2 (cont)		
A2R12	Res, 2260 ohms, same as A2R11		
A2R13	Res, 33.2 k ohms ±1%, 1/10 W, film	511 23322 10	2
A2R14	Res, 10 k ohms ±1%, 1/10 W, film	511 21002 10	3
A2R15	Res, 10 k ohms, same as A2R14		
A2R16	Res, 33.2 k ohms, same as A2R13		
A2R17	Res, 10 k ohms, same as A2R14		
A2R18	Res, 82.5 k ohms ±1%, 1/10 W, film Used on Circuit Card Assembly 110 00028 00	511 28252 10	1
A2R18	Res, 68.1 k ohms ±1%, 1/10 W, film Used on Circuit Card Assembly 110 00028 01	511 26812 10	1
A2R19	Res, 2260 ohms, same as A2R11		
A2R20	Res, 1000 ohms ±1%, 1/10 W, film	511 21001 10	1
A2R21	Res, var, 500 ohms ±20%, 1/2 W	542 00010 00	1
A2Y1	Crystal, 250.0000 kHz	765 00011 00	1

PARTS LIST

REF DES	DESCRIPTION	RYCOM NO.	QTY/ ASSY
	LOCAL OSCILLATOR ASSEMBLY A3		
A3	Circuit Card Assembly, Local Oscillator See figure 7 for component location	110 00029 00	
A3C1	Cap, 0.1 uF (+80%, -20%), 25 wvdc, disc ceramic	600 00003 12	1
A3C2	Cap, 0.1 uF ±10%, 200 wvdc, mylar	620 00025 00	3
A3C3	Cap, 0.1 uF, same as A3C2		
A3C4	Cap, 0.01 uF ±20%, 100 wvdc, disc ceramic	600 00001 03	2
A3C5	Cap, 0.1 uF, same as A3C2		
A3C6	Cap, 1500 pF ±5%, 100 wvdc, silver mica	611 21500 21	1
A3C7	Cap, 4000 pF ±5%, 100 wvdc, silver mica	611 24000 21	1
A3C8	Cap, 22 pF ±5%, 1000 wvdc, N750, disc ceramic	601 00001 07	1
A3C9	Cap, 33 pF ±5%, 1000 wvdc, N220, disc ceramic	601 00001 13	1
A3C10	Cap, var, 1.7-20 pF, air dielectric	650 00006 01	1
A3C11	Cap, 130 pF ±5%, 200 wvdc, N080, disc ceramic	601 00006 04	1
A3C12	Cap, var, 2.2-34 pF, air dielectric	650 00006 00	3
A3C13	Cap, 100 pF ±5%, 1000 wvdc, N330, disc ceramic	601 00001 25	1
A3C14	Cap, var, 2.2-34 pF, same as A3C12		
A3C15	Cap, 22 pF ±5%, 1000 wvdc, NPO, disc ceramic	601 00001 05	1
A3C16	Cap, var, 2.2-34 pF, same as A3C12		
A3C17	Cap, 180 pF ±5%, 500 wvdc, NPO, disc ceramic	601 00003 11	1
A3C18	Cap, 0.01 uF, same as A3C4		
A3C19	Cap, 22 pF ±5%, 100 wvdc, silver mica	610 00220 21	1
A3CR1	Diodes, matched pair	715 00001 00	1
A3L1	Coil, rf, 1.0 mH	701 00017 02	1
A3L2	Coil, rf, 150 uH	701 00015 00	2
A3L3	Coil, rf, var, 2.5-5 uH	701 00007 01	1
A3L4	Coil, rf, 150 uH, same as A3L2		
A3Q1	Transistor, silicon, NPN, selected 2N3710	400 00002 01	2
A3Q2	Transistor, same as A3Q1		
A3R1	Res, 68 ohms ±5%, 1/2 W, carbon	502 00680 00	2
A3R2	Res, 68 ohms, same as A3R1		
A3R3	Res, 680 ohms ±5%, 1/2 W, carbon	502 00681 00	1
A3R4	Res, 1000 ohms ±5%, 1/2 W, carbon	502 00102 00	3
A3R5	Res, 3300 ohms ±5%, 1/2 W, carbon	502 00332 00	1

REF DES	DESCRIPTION	RYCOM NO.	QTY/ ASSY
	LOCAL OSCILLATOR ASSEMBLY A3 (cont)		
A3R6	Res, 10 k ohms ±5%, 1/2 W, carbon	502 00103 00	2
A3R7	Res, 10 k ohms, same as A3R6		
A3R8	Res, 2700 ohms ±5%, 1/2 W, carbon	502 00272 00	1
A3R9	Res, 1000 ohms, same as A3R4		
A3R10	Res, 1000 ohms, same as A3R4		
A3R11	Res, 47 ohms ±5%, 1/2 W, carbon	502 00470 00	1
A3S3	Switch, rotary, detent only	720 00023 00	1
A3S3	Switch, rotary, wafer only	720 00023 01	1
A3T1	Transformer, balanced demodulator	700 00031 00	1

PARTS LIST

REF DES	DESCRIPTION	RYCOM NO.	QTY/ ASSY
	I-F ASSEMBLY A4		
A4	Circuit Card Assembly, I-F, 50 Hz, 100 Hz	110 00020 00	
A4	Circuit Card Assembly, I-F, 250 Hz See figure 8 for component location	110 00020 02	
A4C1	Cap, 0.01 uF ±20%, 100 wvdc, disc ceramic	600 00001 03	6
A4C2	Cap, 0.1 uF (+80%, -20%), 25 wvdc, disc ceramic	600 00003 12	10
A4C3	Cap, 0.1 uF ±10%, 200 wvdc, mylar	620 00025 00	4
A4C4	Cap, 0.1 uF, same as A4C2		
A4C5	Cap, 0.1 uF, same as A4C2		
A4C6	Cap, 0.01 uF, same as A4C1		
A4C7	Cap, var, 5-25 pF, 350 wvdc, NPO, ceramic	660 00003 02	4
A4C8	Cap, var, 5-25 pF, same as A4C7		
A4C9	Cap, var, 5-25 pF, same as A4C7		
A4C10	Cap, var, 5-25 pF, same as A4C7		
A4C11	Cap, 68 pF ±5%, 100 wvdc, silver mica	610 20068 21	1
A4C12	Cap, 0.01 uF, same as A4C1		
A4C13	Cap, 0.1 uF, same as A4C3		
A4C14	Cap, 0.1 uF, same as A4C2		
A4C15	Cap, 0.1 uF, same as A4C2		
A4C16	Cap, 0.01 uF, same as A4C1		
A4C17	Cap, 0.1 uF, same as A4C3		
A4C18	Cap, 0.1 uF, same as A4C2		
A4C19	Cap, 0.1 uF, same as A4C2		
A4C20	Cap, 0.1 uF, same as A4C2		
A4C21	Cap, 0.01 uF, same as A4C1		
A4C22	Cap, 0.1 uF, same as A4C3		
A4C23	Cap, 0.1 uF, same as A4C2		
A4C24	Cap, 0.1 uF, same as A4C2		
A4C25	Cap, 0.01 uF, same as A4C1		
A4CR1	Diode, germanium, type 1N277	410 00005 00	1
A4FL1	Filter, bandpass, 2215 kHz, 50-Hz BW Used on Circuit Card Assembly 110 00020 00	760 00007 00	1
A4FL1	Filter, bandpass, 2215 kHz, 100-Hz BW Used on Circuit Card Assembly 110 00020 00	760 00006 00	1
A4FL1	Filter, bandpass, 2215 kHz, 250-Hz BW Used on Circuit Card Assembly 110 00020 02	760 00005 00	1
A4FL2	Filter bandpass, 2215 kHz, 2500-Hz BW	760 00004 00	1
A4L1	Coil, rf, 1.0 mH, 34 ohms dc resistance	701 00017 02	3
A4L2	Coil, rf, 1.0 mH, same as A4L1		
A4L3	Coil, rf, 1.0 mH, same as A4L1		

REF DES	DESCRIPTION	RYCOM NO.	QTY/ ASSY
	I-F ASSEMBLY (cont)		
	The following transistors are used on Circuit Card Assembly 110 00020 00		
A4Q1	Transistor, silicon, NPN, type 2N4124	400 00018 00	6
A4Q2	Transistor, same as A4Q1		
A4Q3	Transistor, silicon, NPN, selected 2N3710	400 00002 01	2
A4Q4	Transistor, same as A4Q1		
A4Q5	Transistor, same as A4Q1		
A4Q6	Transistor, same as A4Q1		
A4Q7	Transistor, same as A4Q1		
A4Q8	Transistor, same as A4Q3		
	The following transistors are used on Circuit Card Assembly 110 00020 02		
A4Q1	Transistor, silicon, NPN, selected 2N3710	400 00002 01	7
A4Q2	Transistor, same as A4Q1		
A4Q3	Transistor, same as A4Q1		
A4Q4	Transistor, same as A4Q1		
A4Q5	Transistor, same as A4Q1		
A4Q6	Transistor, silicon, NPN, type 2N4124	400 00018 00	1
A4Q7	Transistor, same as A4Q1		
A4Q8	Transistor, same as A4Q1		
A4R1	Res, 200 ohms ±5%, 1/2 W, carbon	502 00201 00	1
A4R2	Res, 6200 ohms ±5%, 1/2 W, carbon	502 00622 00	1
A4R3	Res, 4300 ohms ±5%, 1/2 W, carbon	502 00432 00	1
A4R4	Res, 10 k ohms ±5%, 1/2 W, carbon	502 00103 00	7
A4R5	Res, var, 200 ohms ±20%, 1/2 W, cermet	542 00007 00	1
A4R6	Res, 390 ohms ±5%, 1/2 W, carbon	502 00391 00	4
A4R7	Res, 10 k ohms, same as A4R4		
A4R8	Res, 2700 ohms ±5%, 1/2 W, carbon	502 00272 00	2
A4R9	Res, 3900 ohms ±5%, 1/2 W, carbon	502 00392 00	2
A4R10	Res, 680 ohms ±5%, 1/2 W, carbon	502 00681 00	2
A4R11	Res, 390 ohms, same as A4R6		
A4R12	Res, 1100 ohms ±5%, 1/2 W, carbon	502 00112 00	1
A4R13	Res, 47 k ohms ±5%, 1/2 W, carbon	502 00473 00	1
A4R14	Res, 18 k ohms ±5%, 1/2 W, carbon	502 00183 00	1
A4R15	Res, 10 k ohms, same as A4R4		
A4R16	Res, 3900 ohms, same as A4R9		
A4R17	Res, 1000 ohms ±5%, 1/2 W, carbon	502 00102 00	3
A4R18	NOT USED		
A4R19	Res, 10 k ohms, same as A4R4		
A4R20	Res, 4700 ohms ±5%, 1/2 W, carbon	502 00472 00	1
A4R21	Res, 1000 ohms, same as A4R17		
A4R22	Res, 10 k ohms, same as A4R4		

PARTS LIST

REF DES	DESCRIPTION	RYCOM NO.	QTY/ ASSY
	I-F ASSEMBLY (cont)		
A4R23	Res, 2200 ohms ±5%, 1/2 W, carbon	502 00222 00	1
A4R24	Res, 390 ohms, same as A4R6		
A4R25	Res, 10 k ohms, same as A4R4		
A4R26	Res, 27 k ohms ±5%, 1/2 W, carbon	502 00273 00	1
A4R27	Res, 1000 ohms, same as A4R17		
A4R28	Res, 10 k ohms, same as A4R4		
A4R29	Res, 3300 ohms ±5%, 1/2 W, carbon	502 00332 00	1
A4R30	Res, 2700 ohms, same as A4R8		
A4R31	Res, 390 ohms, same as A4R6		
A4R32	Res, 680 ohms, same as A4R10		
A4R33	Res, Selected as required	500 Series	
A4R34	Res, Selected as required	500 Series	
A4S4	Switch, rotary, detent only	720 00019 00	1
A4S4	Switch, rotary, wafer only	720 00019 01	1
A4T1	Transformer, I-F, 2215 kHz	700 00004 00	3
A4T2	Transformer, same as A4T1		
A4T3	Transformer, same as A4T1		

REF DES	DESCRIPTION	RYCOM NO.	QTY/ ASSY
	MONITOR ASSEMBLY A5		
A5	Circuit Card Assembly, Monitor See figure 9 for component location	110 00079 01	
A5C1	Cap, .1 uF (+80%, -20%), 25 wvdc, disc ceramic	600 00003 12	2
A5C2	Cap, 10 uF, ±20%, 15 wvdc, tantalum	640 00001 01	1
A5C3	Cap, 200 pF ±5%, 100 wvdc, silver mica	610 20200 21	1
A5C4	Cap, .1 uF, same as A5C1		
A5C5	Cap, 30 pF ±5%, 100 wvdc, silver mica	610 20030 21	1
A5C6	Cap, .01 uF (+80%, -20%), 25 wvdc, disc ceramic	600 00003 00	4
A5C7	Cap, .01 uF, same as A5C6		
A5C8	Cap, .01 uF, same as A5C6		
A5C9	Cap, .01 uF, same as A5C6		
A5C10	Cap, 1 uF ±20%, 35 wvdc, tantalum	640 00001 03	1
A5C11	Cap, 22 uF (+50%, -10%), 16 wvdc alum. elect'c	630 00001 01	1
A5C12	Cap, 22 uF, 35 wvdc, alum elect'c	630 00004 00	1
A5CR1	Diode, germanium, 1N277	410 00005 00	2
A5CR2	Diode, same as A5CR1		
A5I1	Integrated Circuit, LM340T-5.0	431 00064 01	1
A5I2	Integrated Circuit, LM377N	431 00058 01	1
A5L1	Coil, r-f, 500 uH	701 00017 01	1
A5Q1	Transistor, FET, 2N5484 selected	400 00001 01	1
A5Q2	Transistor, PNP, silicon, 2N3702	400 00012 00	1
A5R1	Res, 1000 ohms ±5%, 1/4 W, carbon	500 00102 00	4
A5R2	Res, 56 k ohms ±5%, 1/4 W, carbon	500 00563 00	1
A5R3	Res, 1 Meg ohm ±5%, 1/4 W, carbon	500 00105 00	3
A5R4	Res, 1000 ohms, same as A5R1		
A5R5	Res, 2200 ohms ±5%, 1/4 W, carbon	500 00222 00	1
A5R6	Res, 2400 ohms ±5%, 1/4 W, carbon	500 00242 00	1
A5R7	Res, 1000 ohms, same as A5R1		
A5R8	Res, 1000 ohms, same as A5R1		
A5R9	Res, 4700 ohms ±5%, 1/4 W, carbon	500 00472 00	3
A5R10	Res, 4700 ohms, same as A5R9		
A5R11	Res, 4700 ohms, same as A5R9		
A5R12	Res, 3900 ohms ±5%, 1/4 W, carbon	500 00392 00	1
A5R13	Res, 1 Meg ohm, same as A5R3		
A5R14	Res, 5600 ohms ±5%, 1/4 W, carbon	500 00562 00	1
A5R15	Res, 100 k ohms ±5%, 1/4 W, carbon	500 00104 00	1
A5R16	Res, 1 Meg ohm, same as A5R3		

PARTS LIST

REF DES	DESCRIPTION	RYCOM NO.	QTY/ ASSY
	MONITOR ASSEMBLY (cont)		
A5S5	Switch, rotary, detent only	720 00041 00	1
A5S5	Switch, rotary, wafer only	720 00021 01	1
A5VR1	Diode, Zener, 4.3 V, 1N5229B	410 00035 00	1
A5Y1	Crystal, 2216.500 kHz	765 00004 00	1
A5Y2	Crystal, 2213.500 kHz	765 00003 00	1

PARTS LIST

REF DES	DESCRIPTION	RYCOM NO.	QTY/ ASSY
	POWER SUPPLY ASSEMBLY A6		
A6C1	Cap, 220 uF (+100%, -10%), at 85°C 63 wvdc, dry electrolytic	630 00005 08	1
A6CR1	Diode, full-wave bridge, 1.0 amp, 100 PIV	410 00025 00	1
A6R1	Res, 200 ohms ±5%, 5 W, wire-wound	560 00003 00	1
A6R2	Res, 820 ohms ±5%, 1/2 W, carbon	502 00821 00	1
A6VR1	Doide, Zener, 15 V ±10%, 10 W, type 1N2979A	410 00007 00	1

PARTS LIST

REF DES	DESCRIPTION	RYCOM NO.	QTY/ ASSY
	COUNTER OUTPUT ASSEMBLY A7		
A7	Circuit Card Assembly, Counter Output See Figure 10 for component location	110 00025 00	
A7C1	Cap, 0.01 uF ±20%, 100 wvdc, disc ceramic	600 00001 03	3
A7C2	Cap, 0.1 uF (+80%, -20%), 25 wvdc, disc ceramic	600 00003 12	2
A7C3	Cap, 10 uF ±20%, 10 wvdc, tantalum	640 00001 00	5
A7C4	Cap, 10 uF, same as A7C3		
A7C5	Cap, 180 pF ±5%, 100 wvdc, silver mica	610 20180 21	2
A7C6	Cap, 200 pF ±5%, 100 wvdc, silver mica	610 20200 21	3
A7C7	Cap, 230 pF ±5%, 100 wvdc, silver mica	610 20230 21	1
A7C8	Cap, 200 pF, same as A7C6		
A7C9	Cap, 180 pF, same as A7C5		
A7C10	Cap, 10 uF, same as A7C3		
A7C11	Cap, 10 uF, same as A7C3		
A7C12	Cap, 10 uF, same as A7C3		
A7C13	Cap, 0.01 uF, same as A7C1		
A7C14	Cap, 0.01 uF, same as A7C1		
A7C15	Cap, 200 pF, same as A7C6		
A7C16	Cap, 0.1 uF, same as A7C2		
A7IC1	Integrated Circuit, type CA3028A	431 00010 00	1
A7L1	Coil rf, 1 mH	701 00017 02	2
A7L2	Coil Assy, 2 incapsulated coils, 28.5 mH and 100 mH	701 00002 01	2
A7L3	Coil Assy, same as A7L2		
A7L4	Coil, 1 mH, same as A7L1		
A7Q1	Transistor, silicon, NPN, selected 2N3710	400 00002 01	5
A7Q2	Transistor, same as A7Q1		
A7Q3	Transistor, same as A7Q1		
A7Q4	Transistor, same as A7Q1		
A7Q5	Transistor, same as A7Q1		
A7R1	Res, 270 ohms ±5%, 1/4 W, carbon	500 00271 00	2
A7R2	Res, 18 k ohms ±5%, 1/4 W, carbon	500 00183 00	2
A7R3	Res, 3900 ohms ±5%, 1/4 W, carbon	500 00392 00	1
A7R4	Res, 1500 ohms ±5%, 1/4 W, carbon	500 00152 00	2
A7R5	Res, 820 ohms ±5%, 1/4 W, carbon	500 00821 00	2
A7R6	Res, 2200 ohms ±5%, 1/4 W, carbon	500 00222 00	2
A7R7	Res, 2200 ohms, same as A7R6		

REF DES	DESCRIPTION	RYCOM NO.	QTY/ ASSY
	COUNTER OUTPUT ASSEMBLY A7 (cont)		
A7R8	Res, 1000 ohms ±5%, 1/4 W, carbon	500 00102 00	1
A7R9	Res, 820 ohms, same as A7R5		
A7R10	Res, 180 ohms ±5%, 1/4 W, carbon	500 00181 00	1
A7R11	Res, 620 ohms ±5%, 1/4 W, carbon	500 00621 00	2
A7R12	Res, 1500 ohms, same as A7R4		
A7R13	Res, 270 ohms, same as A7R1		
A7R14	Res, 39 k ohms ±5%, 1/4 W, carbon	500 00393 00	1
A7R15	Res, 10 k ohms ±5%, 1/4 W, carbon	500 00103 00	1
A7R16	Res, 2700 ohms ±5%, 1/4 W, carbon	500 00272 00	1
A7R17	Res, 100 k ohms ±5%, 1/4 W, carbon	500 00104 00	2
A7R18	Res, 100 k ohms, same as A7R17		
A7R19	Res, 18 k ohms, same as A7R2		
A7R20	Res, 4700 ohms ±5%, 1/4 W, carbon	500 00472 00	1
A7R21	Res, 620 ohms, same as A7R11		

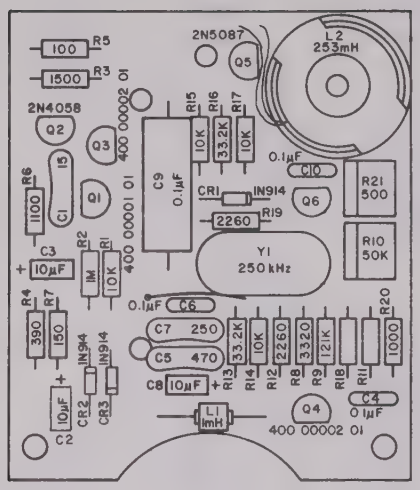


Figure 6. Cal-Osc Assembly A2

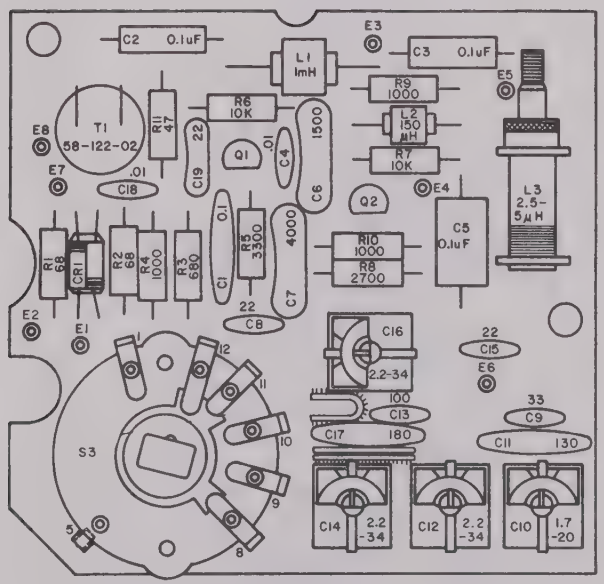


Figure 7. Local Oscillator Assembly A3

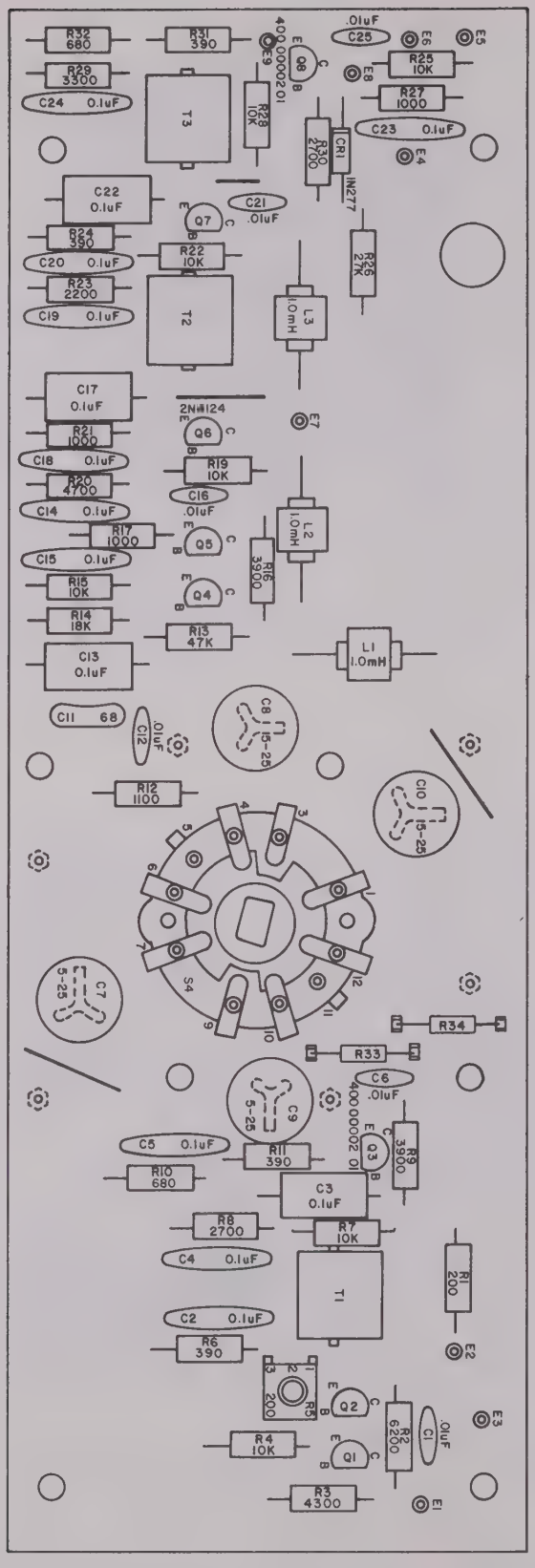


Figure 8. I-f Assembly A4

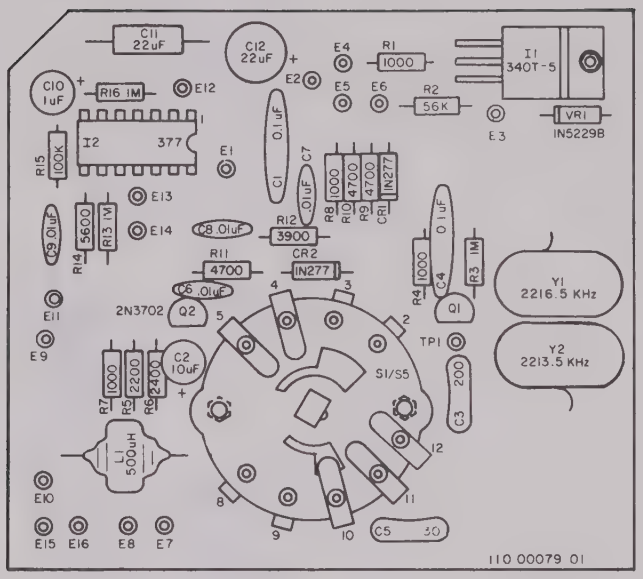


Figure 9. Monitor Assembly A5

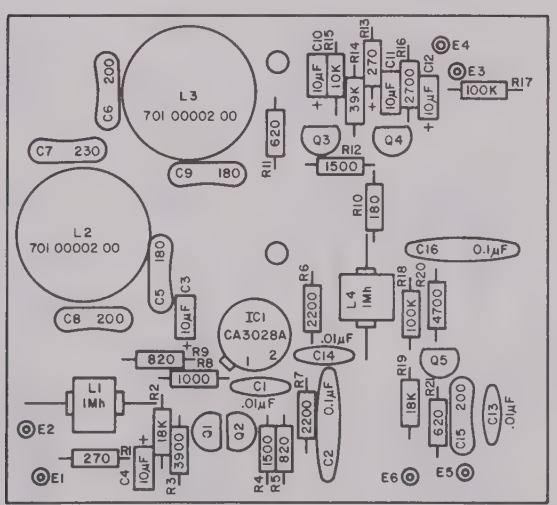


Figure 10. Counter Output Assembly A7

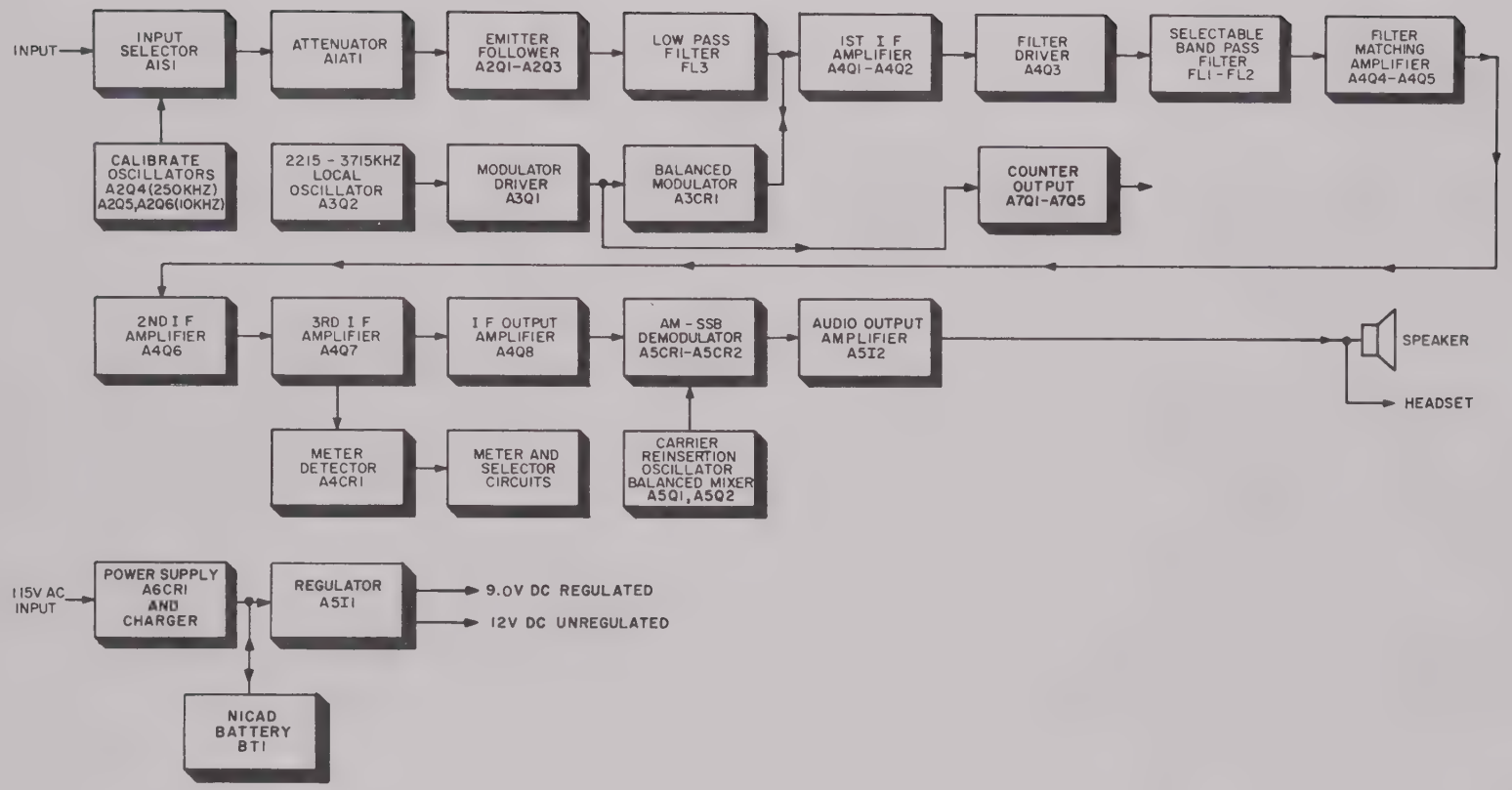


Figure 11
Block Diagram

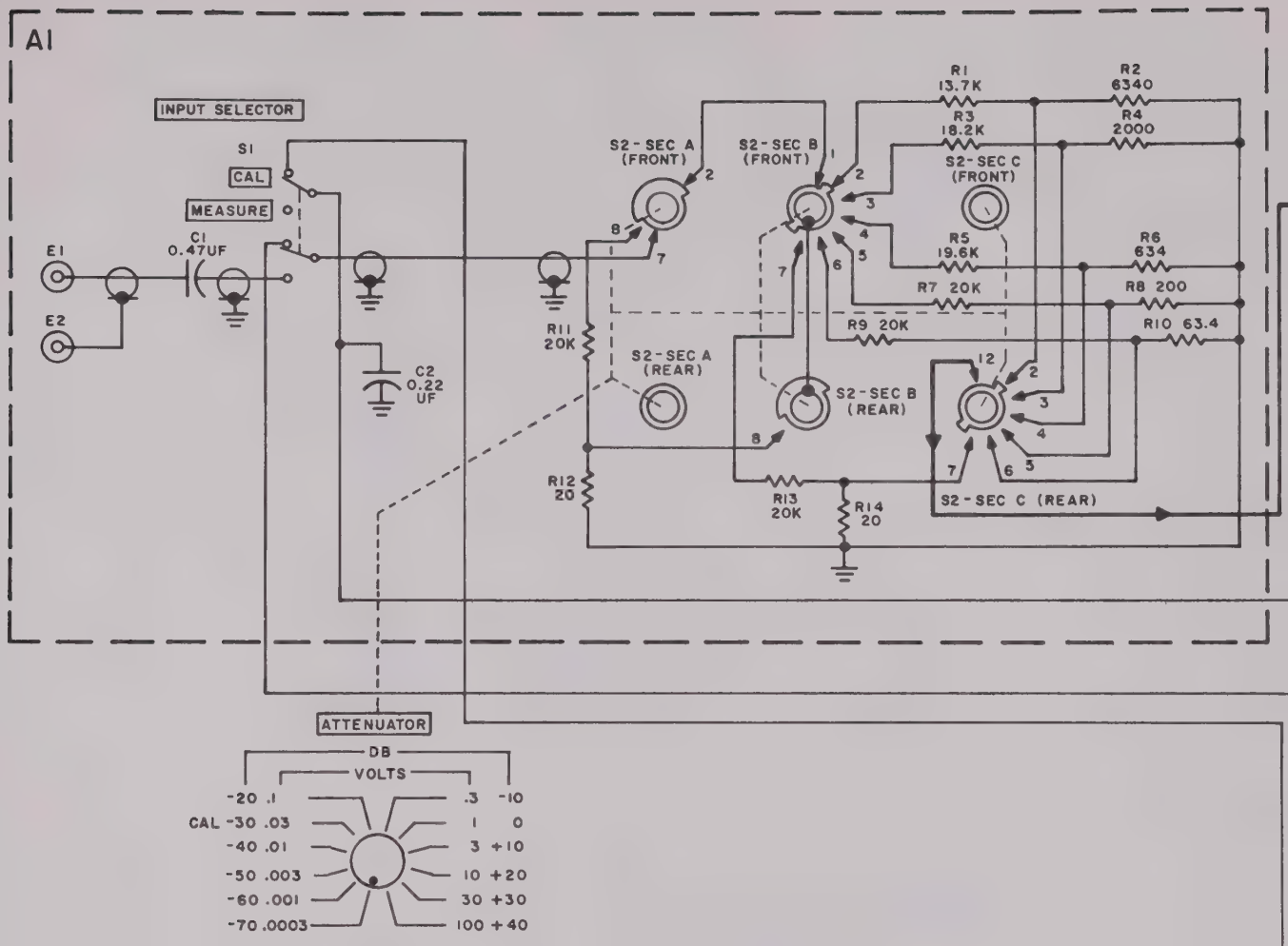
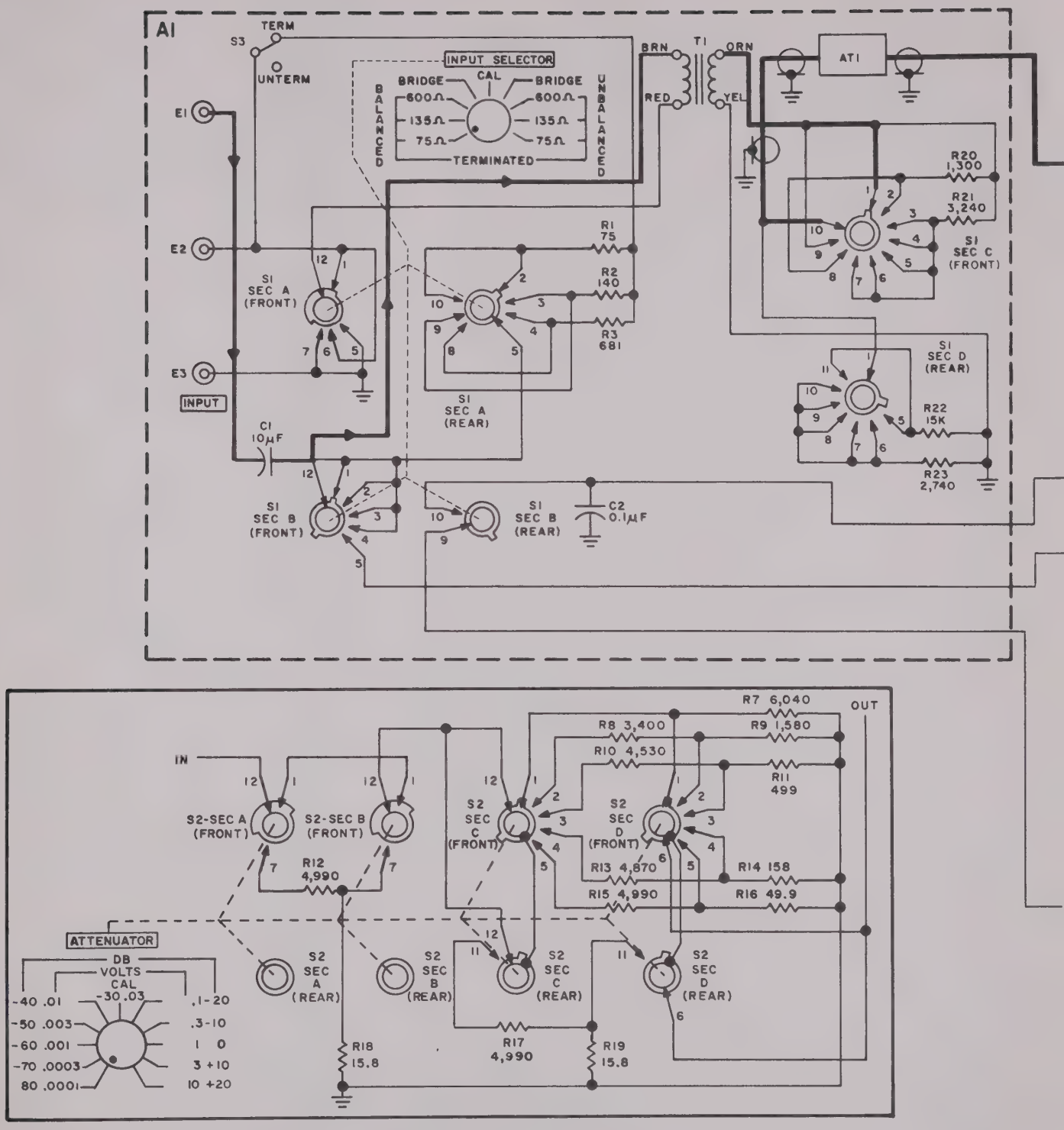
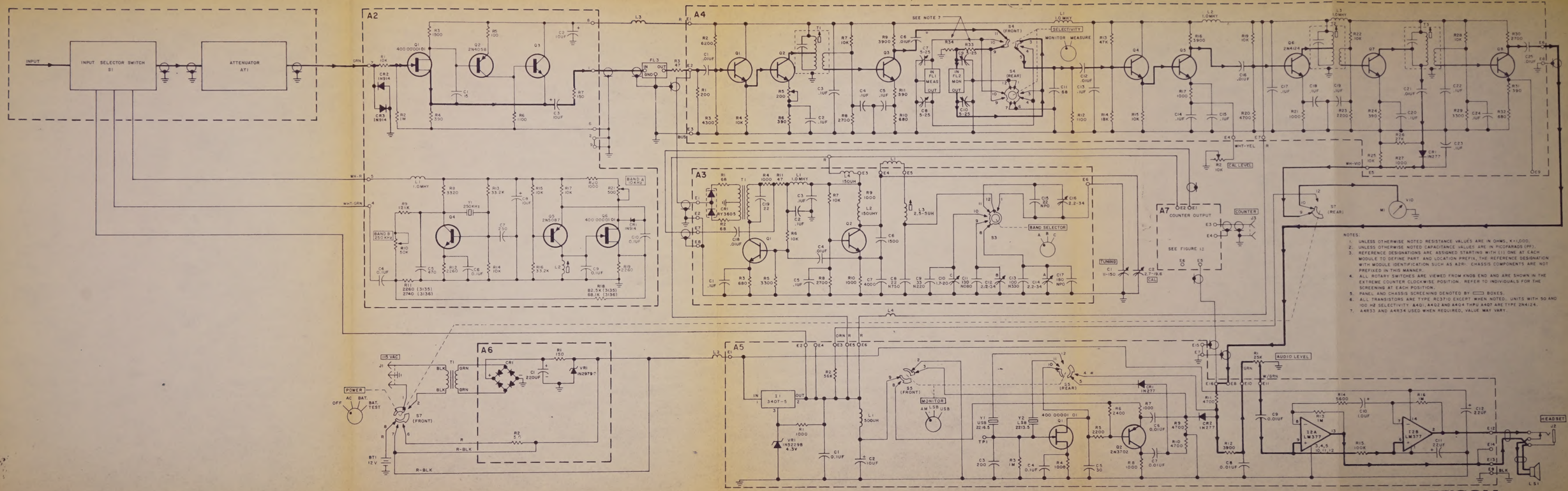


Figure 12A. Schematic Diagram, 3135 Input



ATTENUATOR AT1
PART OF MODULE A1 ABOVE



DWG NO 032 00083 00 DRIG M.S.
3135 SER. NO. 403 -
3136 SER. NO. 240 -

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FIGURE 12, SCHEMATIC DIAGRAM, 3135, 3136 SELECTIVE VOLTMETER

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